Table 2–7. Summary Logistics for Borrow Material Transport
(Truck or Rail Haul Double Work Shift)

Borrow Material	Klondike Flats Alternative			Crescent Junction Alternative			White Mesa Mill Alternative		
	Daily Round-Trips	Total Volume (yd^3)	Total Ship.	Daily Round-Trips	Total Volume (yd^3)	Total Ship.	Daily Round-Trips	Total Volume (yd^3)	Total Ship.
Cover soils	43	1,243,000	37,800	NA[a]	1,243,000	NA[a]	NA[a]	1,243,000	NA[a]
Radon barrier soils	NA[a]	294,000	NA[a]	NA[a]	294,000	NA[a]	NA[a]	294,000	NA[a]
Sand and gravel	7	215,750	6,538	7	215,750	6,300	7	215,750	6,300
Riprap	2	43,400	1,973	2	43,400	1,973	2	43,400	1,973
Moab reclam. soils	15	424,867	12,875	15	424,867	12,875	15	424,867	12,875
Total	**67**	**2,221,017**	**59,186**	**24**	**2,221,017**	**21,148**	**24**	**2,221,017**	**21,148**

[a]Material available at off-site disposal location.

2.2.4 Transportation of Tailings Pile and Other Contaminated Material

DOE evaluated the truck and pipeline modes of transportation for all three potential sites. Rail service was determined not feasible for the White Mesa Mill site because no rail service is available; therefore, this mode was evaluated only for the Klondike Flats and Crescent Junction sites. Table 2–8 shows the estimated source material quantities that would be transported under the off-site disposal alternative. Figure 2–14 shows the Moab site and the proposed truck and rail routes. The proposed slurry pipeline routes are shown in Figure 2–15, and detailed maps are presented in Appendix C.

Table 2–8. Source Material Quantities

Source Material	Volume (yd^3)	Weight (dry short tons)
Uranium mill tailings	7,800,000	10,500,000
Pile surcharge	445,000	600,000
Subpile soil	420,000	566,000
Off-pile contaminated site soils	173,000	234,000
Vicinity property material	29,400	39,700
Total	**8,867,400**	**11,939,700**

2.2.4.1 Truck Transportation

DOE analyzed highway truck transportation for all three alternative sites and two work shift scenarios. Existing highways would be used with some improvements made. The Utah Department of Transportation (UDOT) is currently widening US-191 to a four-lane highway from the Moab site north to SR-313. DOE assumes this would be completed prior to any transportation of tailings from the Moab site. The truck fleet size would vary depending on the disposal site location. An independent trucking company using its own fleet of trucks would do the trucking.

Summary Tabulation of Truck Transportation Logistics

Table 2–9 summarizes logistics information for truck transportation from the Moab site to the three alternative off-site disposal locations.

Table 2–9. Summary Logistics for Truck Transportation from the Moab Site to Three Alternative Off-Site Disposal Locations

	Miles One-Way from the Moab Site to Alternative Disposal Cells					
	Crescent Junction		**Klondike Flats**		**White Mesa Mill**	
On highways	28		14		84	
On access roads	2		4		1	
Total miles	**30**		**18**		**85**	
Miles through community	0.5		0		9.5[a]	
	Truck Production Estimates for Alternative Disposal Cells					
	Crescent Junction		**Klondike Flats**		**White Mesa Mill**	
	1 shift	**2 shifts**	**1 shift**	**2 shifts**	**1 shift**	**2 shifts**
Daily round-trips	219	384	219	384	219	384
Trucks per fleet	36	37	24	26	78	82
Years to complete	3.5	2.0	3.5	2.0	3.5	2.0
Round-Trip Cycle Times (hours)[b]						
Crescent Junction	1.9					
Klondike Flats	1.3					
White Mesa Mill	4.2					

[a]Route to White Mesa Mill site traverses 2 miles through Monticello, 4 miles through Blanding, and 3.5 miles through Moab.
[b]Cycle times would depend primarily on the round-trip distance. However, other factors considered include highway grades, traveling through communities, nonhighway haul roads, and material handling activities such as loading, unloading, and decontamination.

Permits and Exemptions

The proposed 22-ton tandem trailer, hauling a total of 44 tons per truck, would require a special highway permit from UDOT. All work within UDOT rights-of-way would require an encroachment permit from UDOT Region 4. In addition, other federal, Utah, and local requirements would apply. As at other UMTRCA sites, DOE would apply for a DOT exemption to ship uranium mill tailings (see text box titled "DOT Exemption). Regardless of the exemption, DOT would require that each truck be surveyed for radioactivity prior to release from the site and that truck beds be covered to mitigate spills and prevent windblown contamination during transport. No loose radioactivity would be present on the outside of the truck. All transportation would be conducted under a transportation plan that included emergency provisions, manifesting, and specific information regarding any RCRA- or TSCA-regulated material, if applicable.

DOT Exemption

A DOT exemption, similar to that obtained for the DOE UMTRA and Monticello Projects, would allow exemption from specific DOT regulations, including

- 49 CFR 171.15 and 171.16.
- 49 CFR 172.202, .203(c)(1), .203(d), .302(a) and (b), .310, .331, .332, and Part 172 Subpart E and F (labeling and placarding).
- 49 CFR 173.22(a)(1), 173.403 only as it relates to the definition of closed transport vehicles, .427(a)(6) except for requirements stated in this exemption, .443(a).
- 49 CFR 177.817, and .843(a).

These exemptions would allow relief from certain transportation regulations pertaining to uranium and thorium mill tailings, soils, and other materials contaminated with radionuclides from uranium and thorium at the Moab site and vicinity properties. Some of the relief includes the use of closed vehicles and bulk containers without detailed analysis of the contents and with alternative requirements for hazard communication information and packaging. In addition, manifesting each truckload of tailings would not be required under the exemption, nor would labeling of contents or placarding of the truck. As long as the vehicles were protected by tarps or other means to prevent releases, they would not need to be monitored for each trip. A dedicated radioactive materials use statement would be required on the truck, and would have to be removed before the truck was thoroughly decontaminated and released according to DOE standards to haul any other material. A copy of the exemption would have to be carried in the cab of each truck hauling material under the exemption. Emergency reporting requirements are limited to DOE management when more than 1,500 pounds of material is spilled, and the information typically contained in a transportation plan is incorporated as part of the exemption document.

Load, Haul, and Dump Operations

After the tailings were processed and dried to the necessary moisture levels (see Section 2.2.1.2), the transport trucks would be loaded and the truck beds covered with tarps by an automatic tarping device. After the trucks were loaded, the exterior of the trucks would be decontaminated. The trucks would then be scanned for radioactivity and, if clean, released for highway transportation. At the disposal site, the trucks would drive directly into the disposal cell on dedicated haul roads and dump the tailings at designated locations in the cell for spreading, moisture conditioning as needed, and compaction. Figure 2–16 illustrates a typical disposal cell area, haul roads, and other major features.

After dumping, the haul trucks would be decontaminated, scanned for radioactivity, and released prior to leaving the disposal site. As shown in Figure 2–16, the disposal site would include a truck maintenance and fuel storage area. This area would also serve as a parking yard to store one-half of the truck fleet during the off-shift and to park any backup trucks. The other half of the fleet would be stored during the off-shift at the Moab site. An office trailer would also be located at the site to support administration for the trucking service. Fuel storage tanks would range from 5,000 to 20,000 gallons, depending on the disposal cell location, and would have spill containment berms constructed around them.

Truck Maintenance and Storage Facilities at the Disposal Sites and the Moab Site

The following sections describe the transportation-related infrastructure that would be constructed and eventually reclaimed at the Moab site and the three alternative off-site disposal locations.

Moab Site Truck Transportation Infrastructure Construction and Reclamation

Figure 2–17 shows the Moab site and anticipated temporary construction infrastructure that would be required to support a truck haul. New highway access, overpass, and acceleration/deceleration lanes would be constructed for the north haul to Klondike Flats or Crescent Junction or south haul to White Mesa Mill. A new site entrance on US-191 would be built approximately halfway between the existing site entrance and Potash Road (SR-279) on the north side of the Moab site. As seen in Figure 2–17, the proposed new truck transportation infrastructure would be located within the Moab site boundary and therefore would not constitute additional land disturbance beyond the 439-acre site area assumed to be disturbed during surface remediation.

The improvements would all be temporary and would be used only for the life of the tailings haul. Design and construction criteria would meet American Association of State Highway and Transportation Officials (AASHTO) and UDOT standards, with the design life a consideration. At the end of the tailings haulage, the acceleration/deceleration lanes and overpass would be removed and reclaimed. The current US-191 access would be reestablished as the site access.

Klondike Flats Site Truck Transportation Infrastructure Construction and Reclamation

A new overpass across US-191 with a deceleration lane entering it would be constructed for north-bound trucks to access Blue Hills Road and avoid crossing the south-bound lane. The overpass would replace the existing Blue Hills Road turnoff (Figure 2–18). (Note: In Figure 2–18 and other similar figures, the insert showing a typical cell indicates comparative size only. The final location of the cell would be within the larger hatched site area and would be decided after further investigation of surface and subsurface geologic and hydrologic conditions; investigations could also include site-specific cultural or archeological surveys or other sampling.) The existing Blue Hills Road would be paved from US-191 for approximately 2 miles to the tailings pile access exit. The haul road would continue north through the bluffs and into the disposal cell area. The exact configuration of the haul road would depend on where the disposal cell was located within the Klondike Flats site.

The haul road from the highway overpass to the disposal cell would be a private road for truck traffic and cell access only. A new Blue Hills Road access for public use would be constructed south of and parallel to the existing Blue Hills Road for 2 miles. It would reconnect to the existing Blue Hills Road west of where the new haul road would turn north. Access to the new public access Blue Hills Road would be through a new intersection with US-191 south of where the newly constructed private acceleration lane ended. The new Blue Hills Road access would be constructed to the same size and surface condition as the existing Blue Hills Road.

The acceleration lanes, deceleration lanes, and overpass would all be temporary structures to be used only for the life of the tailings haul. Design and construction criteria would meet AASHTO and UDOT standards with the design life a consideration.

At the end of the tailings haulage, the acceleration/deceleration lanes and overpass would be removed and reclaimed. The 2 miles of haul road that is currently the Blue Hills Road would remain paved, and the existing intersection with US-191 would be reconstructed, reestablishing Blue Hills Road to its former public use. The newly constructed Blue Hills Road would be regraded and reclaimed. The new haul road from the existing Blue Hills Road to the disposal cell would remain in place to provide future cell access for inspections.

Crescent Junction Site Truck Transportation Infrastructure Construction and Reclamation

The transportation trucks would use existing US-191 to transport the tailings from the Moab site to the Crescent Junction site. Road improvements would be made from the I-70 overpass to the south side of the Union Pacific rail line (Figure 2–19). A haul road would be constructed parallel to the rail line going east approximately 1 mile, where it would turn north across the railroad tracks and continue to the disposal cell. The exact configuration of the haul road would depend on where the disposal cell was located within the Crescent Junction site.

CR-175, which is the old US-50, lies north of I-70. It parallels the Union Pacific rail line and intersects US-191 north of I-70. The county road is currently paved but would have an asphalt overlay placed on it from US-191 for approximately 1,000 ft to the east. At that point, a new haul road would be constructed north on the same alignment as the current CR-223 for approximately 1,500 ft, and a new at-grade railroad crossing would be constructed. The new haul road would leave the county road alignment and continue northeast to the final disposal cell location. The entire haul road would be paved.

After completion of the tailings haul and disposal cell site reclamation, the truck haul road would continue to be used as an access road to the disposal cell for inspections. Therefore, the haul road would not be reclaimed.

White Mesa Mill Site Truck Transportation Infrastructure Construction and Reclamation

The transportation trucks would use US-191 south of the Moab site through the city of Moab. The haul route would continue on US-191 south through the cities of Monticello and Blanding to the White Mesa Mill entrance (Figure 2–20). US-191 is also the main thoroughfare in Moab, Monticello, and Blanding. A new deceleration and right turn lane would be used for entering the White Mesa Mill site, and existing haul roads on the site would also be used to access the disposal cell. A new overpass with an acceleration lane would be constructed for trucks leaving the site and accessing US-191 north-bound to avoid crossing the highway's south-bound lane. The overpass would be located within the vicinity of the existing White Mesa Mill access.

The overpass and acceleration lane would be temporary structures to be used only for the life of the tailings haul. Design and construction criteria would meet AASHTO and UDOT standards with the design life a consideration. At the end of the tailings haulage, the overpass and acceleration lanes would be removed and reclaimed. The current US-191 access would remain as the site access.

2.2.4.2 Rail Transportation

The existing rail line from Crescent Junction to the Moab site, called the Cane Creek Branch rail line, would be used to transport material from the Moab site to either the Klondike Flats or the Crescent Junction sites. This rail line continues south of the Moab site and dead-ends at the Potash Mine. The only current rail traffic on this line is one train per week to serve the Potash Mine. As shown in Table 2–10, if the off-site rail transport alternative were implemented, the line would carry 4 to 8 round-trips per day from the Moab site to the selected disposal site, depending on the implemented schedule. Tailings haulage would be scheduled for 6 days per week. The 7th day, when the Potash Mine train runs, would be used as a preventive maintenance day for the tailings train.

Table 2–10. Summary Logistics for Rail Transportation from the Moab Site to Two Alternative Off-Site Disposal Cell Sites

Distances/Cycles	Klondike Flats		Crescent Junction	
One-way distance—Moab site to off-load location (miles)	18		30	
Train cycle time (hours)[a]	5–6		10–12	
Train Production	**Klondike Flats**		**Crescent Junction**	
	1 Shift	**2 Shifts**	**1 Shift**	**2 Shifts**
Round-trips per day	4	8	4	8
Years of operation	3.3	1.6	3.3	1.6
Debris Production	**Klondike Flats**		**Crescent Junction**	
	1 Shift	**2 Shifts**	**1 Shift**	**2 Shifts**
Truck loads of debris shipped per day from Moab site	2	5	2	5
Total truck loads of debris shipped from Moab site	2,188	2,188	2,188	2,188
Years of operation	3.3	1.6	3.3	1.6

[a]Train cycle time for hauling a load of tailings from the Moab site to the disposal cell would depend primarily on the distance traveled. Other factors to be considered are rail grades, spur mileage (which would have a lower speed) switching, and other material-handling activities such as loading, unloading, and decontamination. Actual one-way travel times to the Klondike Flats and Crescent Junction sites are estimated at 1.5 and 3 hours, respectively.

An existing rail bed is located along the rail line at the Moab site near the tunnel entrance. A rail siding once existed there to provide rail service to the former Moab mill operations. A new 2,000-ft rail siding would be constructed on the existing rail bed and tied into the rail line with switches. The siding would be used to load tailings onto the rail haul trains, and the rail line would be used for stacking trains and for switching. Each train would consist of 30 standard-size gondola cars, each capable of carrying approximately 100 tons of material. Thus, each train would carry approximately 3,000 tons of material.

The trains would be loaded at the Moab site siding, driven to the disposal cell siding, and unloaded. Trains would then return to the Moab site siding for another load. They would be loaded by dumping material into the top by means of a conveyer and hopper system and unloaded at the disposal site by a rotary dump mechanism that would disconnect each car from the train and rotate it (flip it) to dump the material (Section 2.2.5 describes the process of unloading railcars in more detail). All loaded cars would be covered or treated with surfactants to suppress dust. Loaded cars would be decontaminated at the loadout station (Figure 2–21) before leaving Moab, and empty cars would be decontaminated before leaving the disposal site area.

DOE estimates that 35,000 yd^3 of debris from the Moab site would not be able to be transported by rail because of limitations on the size and shape of material that could be handled by the rail access conveyor (Figure 2–21). This material would be loaded onto highway trucks and hauled to the disposal cell in the same manner as tailings in the truck transportation option. Debris haulage would be spread out over the life of the project to minimize impacts.

Summary Tabulation of Rail Transportation Logistics

Table 2–10 summarizes logistics information for rail transportation from the Moab site to the proposed Klondike Flats and Crescent Junction sites and the estimated debris production for truck shipment.

DOT Requirements

General requirements for manifests, placards, emergency planning, railcar covers, and inspections would be similar to requirements for transport by truck. Other DOT requirements specific to rail transportation would be identified in the transportation plan.

Moab Site Rail Infrastructure Construction, Operations, and Reclamation

Rail Siding

The new 2,000-ft railroad siding would commence directly north of the tunnel entrance at an existing switch point where a new switch would be added. It would require new tracks but no new earthwork. Figure 2–21 shows the Moab site and infrastructure that would be constructed to support train haulage. At the completion of the rail haul, the railroad siding would be removed and all parts recycled. The switches on the main rail line would also be removed and replaced with straight track. As seen in Figure 2–21, all proposed new rail transportation infrastructure would be located within the Moab site boundary and therefore would not constitute additional land disturbance beyond the 439-acre site area assumed to be disturbed during surface remediation.

Conveyor System Construction

The conveyor system would consist of a truck dump bin with a belt feeder at the Moab site that would feed the tailings onto a stacking conveyor belt. As described in Section 2.2.1.2, tailings would be hauled to the conveyor truck dump bin after drying. The conveyor would be used to create a storage pile over belt feeders that would feed onto a conveyor belt. The conveyor belt would exit the millsite, cross SR-279, and continue up the hillside to the railroad siding. The conveyor belt would be vertically aligned to allow clearance over the highway for traffic and not interfere with the existing overhead electric power lines. The conveyor would feed directly into the top of the loadout hopper, which when full would load the railcars by gravity from bottom gates in the hopper. The conveyor system would be totally enclosed to minimize any dust emissions and to capture any spills should they occur. The existing dirt access road that starts at SR-279 and goes to the railroad siding would be upgraded with an all-weather surfacing to allow worker access. Once completed, the conveyor system would be operated by train loadout operators and maintenance mechanics. Figure 2–21 presents the location of the conveyor system, access road, and conveyor profile.

At the completion of the rail haul, the conveyor system would be removed. The conveyor belts, belt racks, feeders, and other components in direct contact with tailings would be treated as contaminated material and disposed of at the disposal cell. Other components such as belt housings and structural steel supports would be reclaimed and salvaged as appropriate. Concrete foundations off the millsite would be demolished and disposed of at the local solid waste landfill, if uncontaminated. Concrete foundations on the millsite would be demolished and disposed of at the disposal cell, as would any contaminated rubble found off the millsite. The access roadway from SR-279 to the rail loadout station would be left in place to be used by railroad personnel for future track and tunnel inspections.

<u>Klondike Flats Site Rail Infrastructure Construction and Reclamation</u>

Figure 2–22 shows the infrastructure that would be constructed to support rail transportation at the Klondike Flats site. A new rail spur from the Cane Creek Branch railroad line would be constructed south of the Blue Hills Road turnoff. This spur would run west parallel to the south side of Blue Hills Road for approximately 1 mile, cross to the north side of the road west of the airport, and continue west parallel to the north side of Blue Hills Road for approximately another mile to a new train/truck transfer station. The spur would extend an additional 2,000 ft to allow for car stacking and would have a 2,000-ft-long rail siding constructed parallel to the rail spur at the end to allow train changeouts during operation. Support facilities for the train, such as a locomotive inspection pit, would be constructed to provide minor preventive maintenance during operations. At the transfer station would be the rotary dump, which decouples each railcar and inverts the car into a dump station for subsequent loading into trucks for final hauling and dumping into the disposal cell.

Figure 2–23 illustrates an operational rotary dump facility similar to the one proposed. The exact configuration of the rail spur and train/truck transfer station would depend on where the disposal cell was located within the Klondike Flats site.

A total of approximately 3 miles of new railroad track spur and siding would be constructed. A new switch would be placed on the Cane Creek Branch railroad line to access the spur. The new alignment would be graded, and culverts would be placed along existing washes. The track would have an at-grade crossing at Blue Hills Road. A haul road would be constructed from the rotary dump to the disposal cell. Infrastructure construction would also include the upgrade of Blue Hills Road to be used for site access. This would consist of regrading the road and making it an all-weather road by placing additional road base and a dust surfactant.

At the completion of the rail haul, the railroad switch, spur, siding, and at-grade crossing would be removed. All rail components would be salvaged. The Blue Hills Road upgrade would remain for future cell access and public access.

Figure 2–23. Operational Rotary Dump Facility

Crescent Junction Rail Infrastructure Construction and Reclamation

Figure 2–24 shows the infrastructure that would be constructed to support rail transportation at the Crescent Junction site. The trains would use the Cane Creek Branch railroad line from the Moab site to Crescent Junction and then use a short stretch of the Union Pacific rail line that runs from Ogden, Utah, to Grand Junction, Colorado. The trains would then proceed east along the Ogden/Grand Junction route for approximately 1 mile, where a new track switch to a siding to the north would be constructed. The siding would be approximately 1 mile long and would end at the train/truck transfer station. The support facilities would be the same as those described for Klondike Flats.

A total of approximately 2.5 miles of new railroad track spur and siding would be constructed to access the disposal cell area. A new switch would be placed on the main rail line to access the spur. The new alignment would be graded, and culverts would be placed in existing washes.

Infrastructure construction would also include constructing an access road from existing CR-175 approximately 1,000 ft east of Crescent Junction. At this point, a new access road would be constructed north on the same alignment as the current CR-223 for approximately 1,500 ft, and a new at-grade railroad crossing would be constructed. The new access road would leave the county road alignment and continue north, paralleling the new rail spur to the transfer station. The entire access road would be gravel. At the completion of the rail haul, the railroad switch, spur, and siding would be removed. All rail components would be salvaged. The access road would remain in place to provide access to the cell.

2.2.4.3 Slurry Pipeline Transportation

The slurry pipeline transportation mode would require the construction of a buried pipeline from the Moab site to one of the three alternative off-site disposal locations. If this option were implemented, tailings would be mixed with water (repulped) at the Moab site to form a semiliquid slurry that would be pumped through the pipeline to the disposal site.

Slurry Pipelines

Slurry pipelines have been used for over 100 years in mining operations to transport both mineral concentrates (ores) and tailings, including coal, copper, iron, phosphates, limestone, lead, zinc, nickel, bauxite, and oil sands. Commercial long-distance transportation of slurries in buried pipelines began in 1967 when the 43-mile Savage River pipeline in Tasmania began transporting iron ore concentrate. It is still operational. Since then, numerous slurry pipelines, ranging in length from a few miles to the 246-mile SAMARCO Pipeline in Brazil, have been constructed in many countries. Most of them are still operating.

At the disposal site, the slurry would be dried by means of a vacuum filtration system, and the dried residue, or filter cake, would be placed in the disposal cell. The recovered water, or filtrate, would be clarified and returned through a second pipeline to the slurry preparation area at the Moab site for reuse. Pipeline Systems, Inc., conducted a conceptual study of a slurry pipeline transportation system for the Moab site. The study (PSI 2003) is incorporated into this draft EIS by reference and is the primary source document for the following synopsis of the slurry pipeline option.

In general, the slurry pipeline systems for the three alternative disposal sites would be very similar except for their lengths and routes, and for one booster pump facility (shown on Figure 2–15 and in Appendix C, Map 8) that would be required for the White Mesa Mill slurry pipeline because of its length. Also, the proposed slurry transport facility at the White Mesa Mill site would require the addition of a substation transformer at the Utah Power Blanding substation and a distribution circuit upgrade from the substation to the White Mesa Mill site. The proposed intermediate slurry pump booster station would require the addition of a substation transformer at the Utah Power La Sal substation and a new approximately 3-mile power line extension to the proposed site for the pump station. A distribution circuit upgrade of the existing line from the substation to its current ending point would also be required. The slurry pipeline systems would be constructed in accordance with American National Standards Institute (ANSI) standard B31.11, *Slurry Transportation Piping Systems* (ANSI/ASME 1989), which applies to the design, construction, inspection, quality control, and security requirements of slurry piping systems, and with other applicable codes.

Pipeline Corridors

Wherever possible, the three proposed corridors would follow existing gas or oil pipeline rights-of-way or road rights-of-way. For each of the three corridors, the slurry pipeline and return water pipeline would be buried in the same trench. Figure 2–15 illustrates the three proposed pipeline corridors, and the following subsections provide detailed descriptions of them. Figure 2–25, Figure 2–26, and Figure 2–27 illustrate the details of the pipelines' final approach to the three alternate disposal cell areas. Figure 2–28 illustrates the approximate locations of the proposed slurry pipeline facilities at the Moab site.

Moab to Klondike Flats Corridor

The slurry pipeline would leave the site south of US-191. The line would parallel the highway south of Moab Wash and cross under the highway 200 ft west of the wash. From that point near the old Arches National Park entrance, it would be buried under the old state highway. The route diverges from the existing US-191 alignment about 1.5 miles north of the existing Arches National Park entrance, then reconverges with US-191 approximately 1 mile south of the SR-313 turnoff. The route north from there could parallel either the existing highway right-of-way or the Williams Gas Pipeline, which is parallel to the highway. This corridor would need to cross under US-191 twice (by boring) and under Courthouse and Moab Washes and also cross one other unnamed wash by either boring or trenching. The route is characterized by rocky areas and sandy/clay sections. The length of the pipeline route for this option would be approximately 18.8 miles. See Maps 3 and 4 of Appendix C for more detailed route information.

Moab to Crescent Junction Corridor

The corridor to Crescent Junction would be the same as the corridor to Klondike Flats until that corridor deviates from the US-191 corridor and heads west towards the disposal site at Klondike Flats. The Crescent Junction corridor would continue north, paralleling the highway and the existing Williams Pipeline corridor. Approximately 4.5 miles south of I-70, the pipeline would parallel the Williams Pipeline, which heads northeast along the county road that is also a cutoff to the town of Thompson. After 4.2 miles, the pipeline would parallel a new pipeline segment that will be installed heading north to the new Williams Pipeline Corporation proposed loadout facility located north of I-70, east of Crescent Junction. In addition to the crossings cited above for the Klondike Flats corridor, the Crescent Junction corridor would also have to be bored under I-70 and under the Union Pacific Railroad. The length of the corridor from Moab to Crescent Junction would be approximately 33.7 miles. See Maps 1 through 4 of Appendix C for more detailed route information.

Moab to White Mesa Mill Corridor

Three operating gas pipelines currently exist along the proposed Moab to White Mesa Mill corridor: Northwest Pipeline (25-inch diameter), Rocky Mountain Pipeline (10-inch diameter) and Mid-American Pipeline (16-inch diameter). The White Mesa Mill corridor would leave the Moab site and run east for about 350 ft, then cross under the Colorado River. A directionally drilled, cased bore is proposed for passing under the river because it offers the highest degree of protection against pipeline damage or leaking. The existing gas pipelines were installed using this technique to avoid affecting the river, local wildlife habitat, and the residential areas of Moab. After crossing the river, the corridor would follow the existing gas pipeline right-of-way, passing around Moab along the base of the cliffs to the southwest of town. The topography along the route southwest of Moab is undulating. Soil and vegetation are sandy loam and sagebrush. After passing around Moab, the corridor would continue following the gas pipeline right-of-way along the west side of US-191.

Approximately 15 miles from the mainline pump station (PS1), which would be located on the Moab site, the corridor would depart from the US-191 right-of-way and head southwest cross-country to avoid steep canyons in the rolling, rocky terrain. This section of the corridor is characterized by weathered sandstones, rocky sandy loam, and sagebrush. The corridor would run cross-country along an oil pipeline right-of-way. This rocky section is approximately

15 miles long. At approximately 30 miles from PS1, the corridor would cross US-191 near Lopez Arch to the east side of the highway. At this location, the terrain changes from rocky rolling hills to relatively flat sandy loam and sagebrush terrain. The proposed booster pump station (PS2) would be located approximately 31.5 miles from PS1.

The corridor would depart from the gas pipeline right-of-way south of PS2 (see Map 8 in Appendix C) and proceed along the east side of US-191 (parallel to the gas pipelines). South of PS2, the terrain is generally flat with average slopes less than 2 percent up to the high point of the corridor, which is approximately 51 miles from the Moab site at an elevation of 6,970 ft above sea level. After reaching this high point, the corridor would proceed east off US-191 for 2 miles to join an existing gas pipeline right-of-way and would pass 2 miles east of the Monticello downtown area, approximately at pipeline milepost 58. From Monticello, the corridor would follow the Blanding gas pipeline right-of-way, a cross-country pipeline route that runs parallel to US-191. The Blanding gas pipeline route joins the US-191 right-of-way at Recapture Dam. The corridor would have to cross Recapture Creek just downstream of the dam and proceed parallel to US-191. The pipeline would diverge from the highway right-of-way just north of Blanding and head south, passing about 1 mile east of the center of Blanding. It would continue south along local unpaved roads or cross-country. The terrain in this area is flat with sandy loam soil, sagebrush, and farmland. Approximately 3 miles south of Blanding, the corridor would turn west and cross US-191 near the Blanding wastewater treatment plant and continue another 3 miles along the west side of US-191 to the White Mesa Mill terminal station. The length for this corridor would be approximately 88.7 miles, of which 60 miles, or about two-thirds, would be on existing gas pipeline rights-of-way; the remainder would use a combination of public and private road that does not currently contain pipeline right-of-way.

Table 2–11 summarizes the general and construction characteristics of the three proposed pipeline corridors.

Table 2–11. Summary of Pipeline Corridor Characteristics

	White Mesa Mill	**Klondike Flats**	**Crescent Junction**
General Characteristics	**Length in Miles**		
Total corridor length	88.7	18.8	33.7
Rock: weathered sandstone	20	7.0	26.6
Soil: sandy loam/clay and sagebrush	66.7	11.8	7.0
Crossings (roads and streams)	1	0.10	0.15
Special Construction Characteristics	**Length in Feet**		
Directional drilled crossings	3,500	300	300
Road bores (highway)	500	200	400
Aerial crossings	500	0	0
Stream crossings (buried)	900	100	100

System Specifications

Regardless of the corridor that would be selected, the slurry pipeline system would be designed to meet the operational parameters shown in Table 2–12.

Table 2–12. Slurry Pipeline System Parameters

Design Life	4 years
Facility operation hours	24 hours per day 7 days per week 365 days/year
Facility overall availability	90 percent
Dry solids throughput	373 short tons per hour
Pipeline slurry concentration	50 percent by weight
Solids specific gravity	2.78
Slurry pipeline flow rate	2,031 gallons per minute (gpm)
Slurry top size	20 mesh (0.03 inch)
Dried solids (filter cake) moisture	15–20 percent by weight
Recycled water flow rate	1,172 gpm less loss from evaporation and dust control measures.
Makeup water flow rate	409 gpm

System Descriptions, Facilities, and Operations

The slurry pipeline system would comprise four major subsystems or facilities: (1) the slurry preparation plant, (2) the mainline slurry system, (3) the terminal station, and (4) the recycle water system. Each of these would be supported by integrated control and monitoring, safety, telecommunications, and electrical systems.

Slurry Preparation Plant

The slurry preparation plant would be located in the tailings pile area of the Moab site and would be common to all three corridors. The primary function of the plant would be to repulp the tailings, regrind oversized tailings, and deliver the required 20-mesh (0.03-inch) slurry to the mainline pump station (PS1). Figure 2–29 illustrates the slurry preparation plant's process flow.

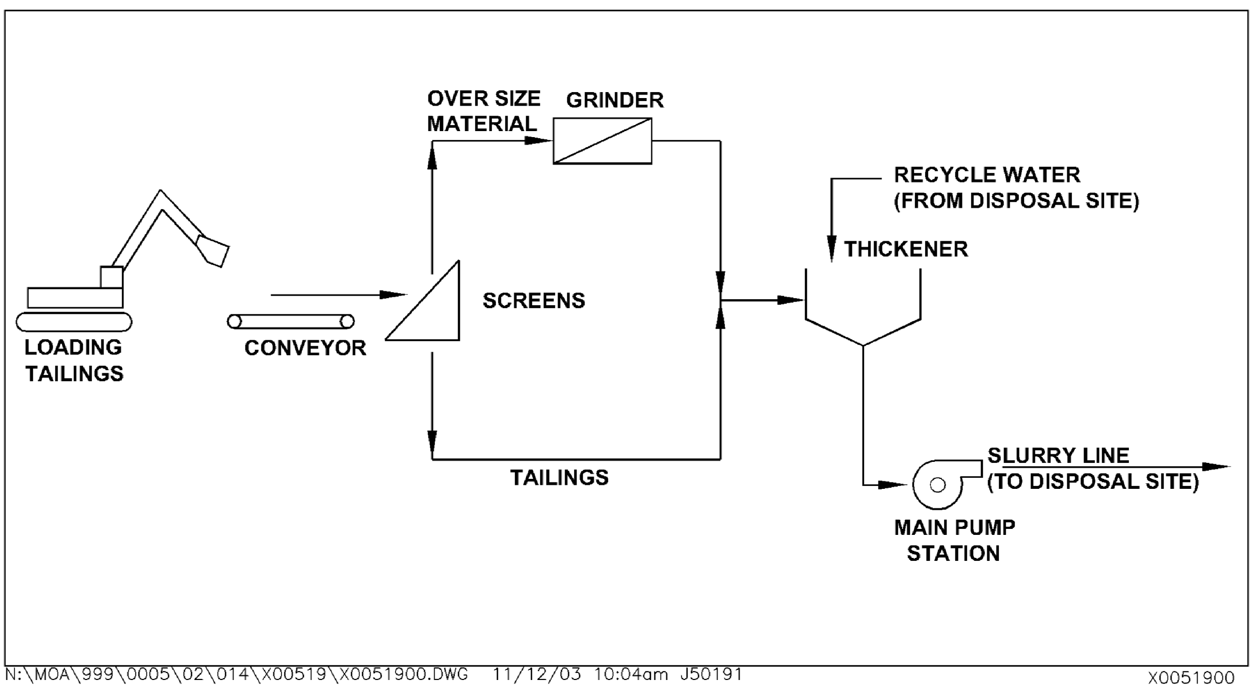

Figure 2–29. Slurry Preparation Plant Process Flow Diagram

Tailings would be excavated as described in Section 2.2.1.2 and delivered to the slurry preparation plant by conveyor, where they would be freed of debris, sized, and amended with water to form a slurry that would be thickened to a 50-percent solids concentration and pumped to the mainline slurry system. Sieved-out material would be milled and reprocessed. Large debris would be removed for truck transport.

Mainline Slurry System

The mainline slurry system would pump the slurry from the Moab site to a terminal at the off-site disposal location. It would comprise (1) a main pump station, which would be common to all three disposal terminal alternatives; (2) a booster pump station, which would be used only if the White Mesa Mill off-site disposal alternative were implemented, (3) a 12-inch-diameter steel pipeline; and (4) one or two pressure monitoring stations. Table 2–13 summarizes the mainline pump operating characteristics.

Table 2–13. Mainline Slurry Pump Characteristics

Slurry Pipeline Corridor	Maximum Mainline Pump Flow Rate (gpm)	Mainline Pump Discharge Pressure (pounds per square inch)	No. of Pump Stations	Total Horsepower
Moab site–White Mesa Mill	2,153	2,800	2	8,276
Moab site–Klondike Flats	2,153	1,200	1	1,773
Moab site–Crescent Junction	2,153	2,000	1	2,956

gpm = gallons per minute

Terminal Station

At the terminal station, the incoming slurry would be dewatered by vacuum filtration. The suction would produce a filter cake with approximately 15- to 20-percent moisture that would be disposed of in the disposal cell. The filtrate (recovered water) would be diverted to a double-lined holding pond or a wet cell, clarified, and pumped back to the slurry preparation plant through the recycle water pipeline. Even if dewatering operations were temporarily down, pipeline operations at White Mesa Mill could continue for weeks (operations at the other sites could continue for several hours) by using the station’s wet cell to receive and temporarily store incoming slurry. In the event of a shutdown, the system would be able to be restarted without significant delay. The filter plant process flow diagram is illustrated in Figure 2–30.

Recycle Water System

The recycle water system would return approximately 80 percent of the slurry water to the Moab site for reuse. Due to some losses of water in the slurry preparation plant, filtering plant, and holding pond, approximately 400 gallons per minute (gpm) of additional (makeup) water would be required at the Moab site either from the Colorado River or from the terminal site, if makeup water were available at the terminal site. Makeup water would be available at the White Mesa Mill site, but the Klondike Flats and Crescent Junction sites would both require installation of new wells. Table 2–14 summarizes the mainline recycle pump operating characteristics.

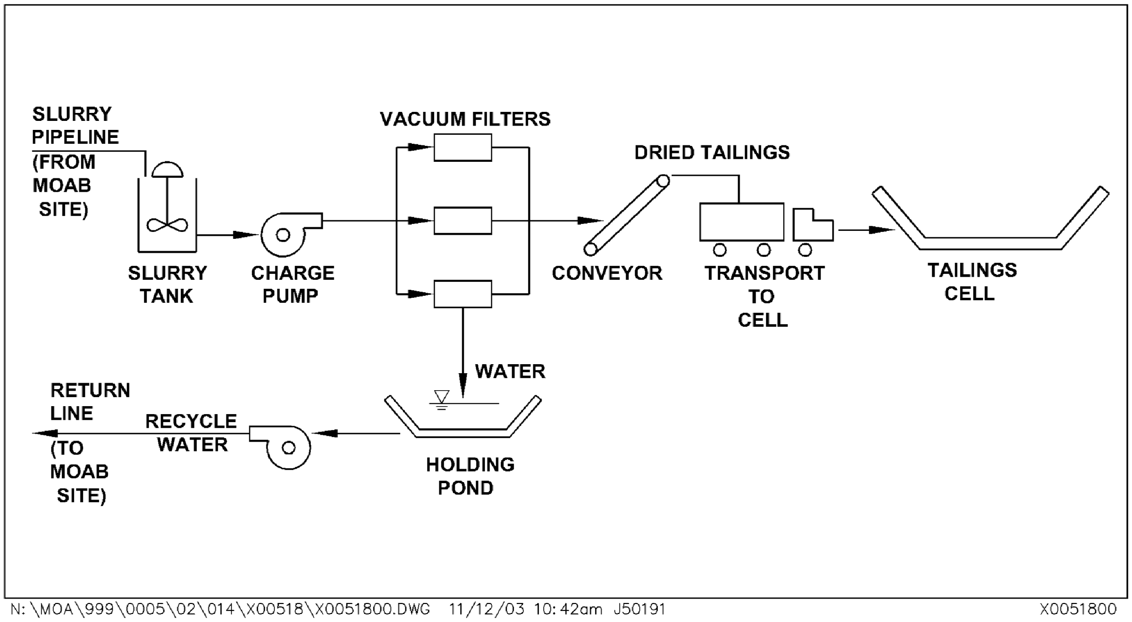

Figure 2–30. Filter Plant Process Flow Diagram

Table 2–14. Mainline Recycle Water Pump System Characteristics

Recycle Water Pipeline Corridor	Flow Rate (gpm)	Discharge Pressure (pounds per square inch)	No. of Pump Stations	Total Horsepower
Moab site–White Mesa Mill	1,172	940	1	918
Moab site–Klondike Flats	1,172	380	1	371
Moab site–Crescent Junction	1,172	640	1	625

Facility Footprints

Table 2–15 gives the estimated square footage requirements for the proposed facilities.

Table 2–15. Facility Land Use Requirements (Footprints)

Facility/Location	Footprint (ft^2)
Moab (common to all site alternatives)	67,000
Booster pump station (White Mesa Mill alternative only)	16,500
Terminal (common to all site alternatives)	40,625

Control/Monitoring and Safety Systems

Control and Monitoring

The slurry pipeline system would be controlled and monitored from a control room at the Moab site, which would be manned constantly. Control room operators/dispatchers would be alerted automatically if abnormal or emergency conditions, such as off-specification slurry, a leak, or a plug in the pipeline, were to occur. System control would be automatic in the steady-state mode. Operator intervention would be required only during process upsets, shutdowns, and restarts. For the White Mesa Mill corridor, isolation valves would be included at both sides of the Colorado River to minimize the possibility of slurry entering the river if a leak were to occur.

Safety

- *Leak Detection and Management*—The pipeline would contain only noncompressible, nonflammable, semiliquid slurry that would not pose an explosion or fire hazard. However, high-pressure slurry could be aggressively abrasive if a leak were to occur. The pipeline would be continuously monitored by a leak detection system. This system would provide operating data for the Supervisory Control and Data Acquisition (SCADA) system via a fiber optic telecommunication system. Flow rate, pressure, and density would be monitored at various points along the pipeline. A pressure monitoring station (two for the White Mesa Mill corridor) with a pressure transmitter powered by a solar panel or other power source would be installed. The objective of the leak detection system would be to detect leaks within 2 to 10 minutes of occurrence (depending on the size and the location of the leak), predict their location, and issue warnings to operators. If there were an indication of a leak, an inspection team would be dispatched. DOE's estimated theoretical spill volume for a pipeline leak is 0.65 to 1.3 yd^3 during the sensing period and 4 yd^3 after the system is shut down. The total spill volume for a leak is expected to be less than 5.2 yd^3 (PSI 2003).
- *Overpressurization Protection*—The pipeline and equipment would be protected from overpressurization by several levels of protection, including proven operating procedures, use of SCADA system software, electrical or hardware interlocks or control loops, and mechanical pressure-relieving devices.
- *Rupture Contingency Plan*—In the unlikely event of a pipeline rupture, installed systems would warn the operator with a prompt to consider activating an emergency shutdown sequence if the data appear valid. A break would result in some slurry loss. Repairs and cleanup, including lining repairs for short sections, could be made in a matter of a few days to 2 weeks.
- *Buried Pipeline*—Although the pipeline could be installed above ground and operated safely, DOE proposes to bury it in order to minimize conflicts with the public and also to prevent punctures from causes such as vehicles and gunshots.

Additional design techniques and safety factors would be applied for all special design points (e.g., thicker steel pipe wall at the river crossing). In areas of potentially severe erosion, design provisions would be based on maximum predicted flood events.

Post-Operational Activities

Post-operational activities would depend on DOE's ultimate decision on the fate of the pipeline. Some commenters have suggested that upon completion of slurry transportation activities the pipeline could be retrofitted for irrigation or other uses. However, any decision on such a future use would be predicated first on a decision that the use would be appropriate and second that a radiological release of the pipeline would be feasible and acceptable. These decisions could not be made until slurry transportation was complete. If DOE decided that other pipeline uses were not appropriate or feasible, upon completion of pipeline slurry operations, DOE would dig up the buried pipelines, compact them, and dispose of them in the disposal cell. The disturbed pipeline right-of-way would then be reclaimed and revegetated.

2.2.5 Construction and Operations at the Off-Site Disposal Locations

This section describes construction and operations at the off-site disposal locations. These activities would be essentially identical for the proposed Klondike Flats and Crescent Junction